Medicine Quiz 11

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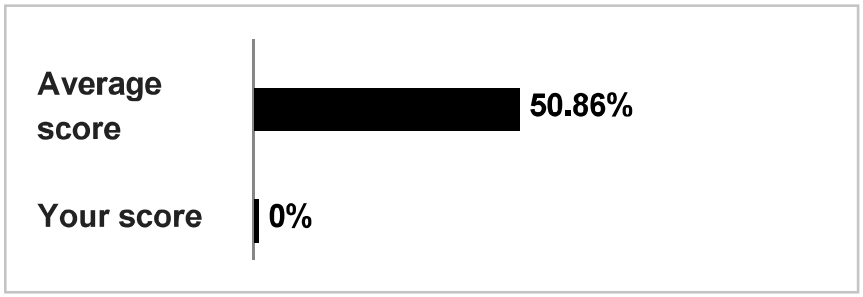

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Answered Review

1. Question **1 points**

A 56-year-old female comes to the office and complains of general malaise and headaches. Her other symptoms are episodic palpitations, throbbing headaches and diaphoresis. She feels “very anxious all the time.” Her past medical history is unremarkable. Her deceased sister had very high blood pressure. Her blood pressure is 230/110 mm Hg and pulse is 110/min. Initial laboratory studies reveal:

WBC: 7,000/cm^2
Hb: 11.2 g/L
Platelets: 325,000/cm^2
Calcium: 11 .9 mg/dl

What is the best next step in the evaluation of this patient?

1. Nuclear renal scan
2. Serum calcitonin levels ✔
3. Endoscopy to look for ulcer disease
4. CT scan of the head

INCORRECT ✖
The correct answer is 2.
Pheochromocytoma, hypercalcemia (suggesting hyperparathyroidism), and a positive family history (e.g., deceased sister with severe hypertension indicates familial pheochromocytoma) are very suggestive of multiple endocrine neoplasia II (MEN IIa). Features of MEN-IIa include medullary carcinoma of the thyroid (MTC), pheochromocytoma and hyperparathyroidism. Virtually 100% of patients with MEN-IIa have C-cell hyperplasia or MTC, 50% have pheochromocytoma, and 20-30% has hyperparathyroidism. Patients with clinical MTC have elevated serum calcitonin levels; therefore, screening for MTC by measuring serum calcitonin levels is the most appropriate next step.
(Choice 1) Nuclear renal scan is used to screen for renovascular hypertension. It is not necessary in this patient, whose clinical features are more suggestive of pheochromocytoma.
(Choice 3) In patients with MEN I, endoscopy is required to look for upper gastrointestinal ulceration induced by excess serum gastrin, which is secreted by gastrinomas that are typically located in the pancreas. MEN I consist of hyperparathyroidism, pituitary and pancreatic tumors. Pancreatic tumors are not seen in MEN II.
(Choice 4) Headaches occur in many patients with Pheochromocytomas, but CT scan of the head is rarely required.

2. Question

1 points

Four of your patients who came to the office today all have signs and symptoms of hyperthyroidism. After the appropriate evaluation, you decided to treat them with radioactive iodine. Hyperthyroid patients with which of the following disorders are most likely to develop hypothyroidism following radioactive therapy?

1. Graves' disease ✔
2. Toxic adenoma
3. Multinodular goiter
4. Ectopic production of thyroid hormones

INCORRECT ✖

The correct answer is 1.

Radioiodine is the most popular treatment for hyperthyroidism in the USA. Radioactive iodine is taken up by thyroid tissue, and causes thyroid ablation via β-emissions. A large number of patients who undergo this mode of treatment develop permanent hypothyroidism, but the chances of developing this complication are greatest in patients with Graves' disease. Since the whole thyroid gland is hyperfunctional in Graves' disease, radioiodine is taken up by the entire thyroid gland, thereby resulting in complete thyroid ablation.

(Choices 2 & 3) Patients with toxic adenoma and multinodular goiter usually remain euthyroid after radioiodine therapy. In such conditions, radioiodine accumulates and destroys only the autonomous areas of the thyroid, and other parts of the gland (i.e., those whose function is suppressed due to the hyperthyroid state) are spared from radioiodine accumulation.

(Choice 4) Radioiodine therapy is least likely to cause permanent hypothyroidism in patients with ectopic production of thyroid hormones. Radioiodine accumulates only in the ectopic source of thyroid hormones, sparing the entire thyroid gland, which is suppressed during this hyperthyroid state.

3. Question

1 points

A 60-year-old male presents to the office with erectile dysfunction that progressed slowly over the last several months. He finds it difficult to obtain an erection, and has noted a decrease in nocturnal erections. His past medical history is significant for diabetes mellitus, type 2 and benign prostatic hypertrophy (BPH). His current medications are glyburide and doxazosin. Physical examination is insignificant. HbA1 c level measured two weeks ago was 7 .5%. He is asking about a prescription for sildenafil. Which of the following is the best statement concerning the treatment of erectile dysfunction in this patient?

1. Tightening of glycemic control improves erectile dysfunction
2. Sildenafil is not a drug of choice for diabetics with erectile dysfunction
3. Sildenafil and doxazosin should be given with at least a 4-hour interval ✔
4. Prostaglandins (alprostadil) are preferred in this patient
5. Sildenafil should not be combined with glyburide

INCORRECT ✖

The correct answer is 3.

Diabetics have a high risk for erectile dysfunction, and this risk progressively increases with the patient's age and duration of diabetes. Vascular complications, neuropathy and medications are considered as the main causes of the increased prevalence of erectile dysfunction in these patients, although psychological causes should not be overlooked. The first-line drugs of treatment are the phosphodiesterase inhibitors (e.g., sildenafil).

Remember the following when treatment with phosphodiesterase inhibitors is being considered:

1 . Sildenafil is contraindicated in patients being treated with nitrates, and in those who are hypersensitive to sildenafil

2. Sildenafil is used with precaution in conditions predisposing to priapism.

3. Concurrent use of drugs which interfere with the metabolism of sildenafil (e.g., erythromycin, cimetidine) may predispose to adverse reactions by prolonging its plasma half life.

4. While combining with an α-blocker, it is important to give the drugs with at least a 4-hour interval to reduce the risk of hypotension.

(Choice 1) Tightening of glycemic control has not been shown to improve erectile dysfunction.

(Choice 2) Phosphodiesterase inhibitors (e.g., sildenafil) are the first-line drugs in the treatment of diabetic patients with erectile dysfunction.

(Choice 4) Treatment with phosphodiesterase inhibitors is preferred to local prostaglandins due to the higher overall efficacy and convenience.

(Choice 5) The combination of sildenafil with glyburide is safe.

4. Question

1 points

A 58-year-old asymptomatic male is found to have elevated levels of serum alkaline phosphate. His serum calcium and phosphate levels are normal. He denies any bone pain or deformity. His liver function tests are normal. The urinary hydroxyproline levels are increased. Nuclear bone scan reveals an increased uptake in the right scapula. Plain radiography confirms Paget's disease. Which of the following is the most appropriate next step in the management of this patient?

1. No treatment is indicated at this stage ✔
2. Treatment with bisphosphonates
3. Treatment with nasal calcitonin
4. Treatment with calcium and vitamin D

INCORRECT ✖

The correct answer is 1.

When evaluating patients with suspected Paget's disease, the initial goal is to establish which bones have been affected. The full extent of the disease is best ascertained by full body bone scan, followed by radiologic confirmation in the documented areas of increased tracer uptake. Nuclear bone scan is not very specific, but very sensitive in detecting the extent of skeletal involvement. In most patients, measurement of the total serum alkaline phosphatase activity is an effective and inexpensive test to determine the activity of Paget's disease.

The indications for treatment of Paget's disease include:

1. Bone pain
2. Hypercalcemia of immobilization
3. Neurological deficit
4. High output cardiac failure
5. Preparation for orthopedic surgery
6. Involvement of weight-bearing bones (to prevent deformities)

Treatment of asymptomatic patients with minimal disease activity is usually not required. Treatment of asymptomatic patients with markedly increased disease activity (as evidenced by very high serum alkaline phosphatase levels) is controversial, although some physicians treat such patients to prevent future complications. In this case, the patient is asymptomatic and does not have markedly elevated alkaline phosphatase levels or localized involvement of non-weight bearing bones; therefore, he does not require any treatment.

(Choice 2) Bisphosphonates are the treatment of choice for Paget's disease. An early effect of these drugs is decreased bone resorption. The action of bisphosphonates persists for months to years after treatment is stopped, making these drugs superior to calcitonin. A number of oral and intravenous bisphosphonates are approved by the FDA for the treatment of Paget's disease.

(Choice 3) Calcitonin also inhibits osteoclastic bone resorption and reduces disease activity in Paget's disease; however, its effect on osteoclasts is much weaker than that of bisphosphonates.

(Choice 4) Treatment with calcium and vitamin D does not have any effect on the Pagetic bone. Nevertheless, it is important to screen patients for vitamin D deficiency because concurrent vitamin D deficiency can increase the bone turnover, which in turn can lead to an additional increase in the serum alkaline phosphatase level.

5. Question **1 points**

A 56-year-old male presents in the emergency department with severe nausea, vomiting, polyuria, polydipsia, and constipation. His past medical history is significant for hypertension and type 2 diabetes mellitus. His home medications include metformin, atenolol, and hydrochlorothiazide. He has a 26-pack-year history of smoking. He drinks alcohol occasionally. He denies the use of recreational drugs. His father also has diabetes mellitus type 2. His blood pressure is 110170 mmHg, pulse is 102/min, temperature is 36.7C (98F) and respirations are 16/min. His mucus membranes are dry. His lung examination reveals decreased breath sounds over the right base. The rest of the physical examination is unremarkable. The patient is subsequently admitted. Laboratory studies (obtained in the emergency department) are as follows:

Serum calcium: 14.8 mg/dl
Albumin: 4.0 g/dl
PTH: 9 pg/ml (normal 10-60 pg/ml)
Serum creatinine: 1.9 mg/dl
BUN: 54 mg/dl
Blood glucose: 180 mg/dl
25-hydroxyvitamin D: 30 ng/ml (normal 20 to 60 ng/ml)
1, 25-dihydroxyvitamin D: 30 pg/ml (normal 15 to 65 pg/ml)

What is the most likely cause of this patient's hypercalcemia? What is the most likely cause of this patient's hypercalcemia?

1. Hypercalcemia of malignancy ✔
2. Primary hyperparathyroidism
3. Hydrochlorothiazide-induced
4. Dehydration E. Sarcoidosis
5. Osteoporosis

INCORRECT ✖

The correct answer is 1.

The patient in this case presents with the typical clinical features (e.g., polyuria, polydipsia, nausea, vomiting, and constipation) and laboratory findings (e.g., severely elevated serum calcium level and suppressed serum PTH level) of hypercalcemia. Furthermore, his significant smoking history and physical examination findings (i.e., decreased breath sounds over the right base) are suggestive of an underlying malignant lung neoplasm. Malignancy is the most common cause of hypercalcemia in admitted patients. Hypercalcemia secondary to malignancy is due to multiple reasons, including osteolytic metastasis, secretion of PT HRP, increased formation of 1 , 25-dihydroxyvitamin D, and increased interleukin-6 levels. PTH levels are suppressed in most patients with hypercalcemia of malignancy. Ectopic PTH secretion from a malignant neoplasm is exceedingly rare.

(Choice 2) Serum calcium levels are generally higher in patients with hypercalcemia due to malignancy than in those with primary hyperparathyroidism (in which calcium levels are rarely above 13 mg/dl). Furthermore, this patient does not have primary hyperparathyroidism because his serum PTH level is suppressed.
(Choice 3) Hydrochlorothiazide can produce mild hypercalcemia. It increases the urinary absorption of calcium, thereby leading to a mild increase in serum calcium levels. Severe hypercalcemia does not occur with hydrochlorothiazide alone; usually, the serum calcium level is high normal or slightly above normal range.
(Choice 4) Dehydration can also produce mild hypercalcemia due to hemoconcentration, but the PTH levels remain normal.
(Choice 5) Sarcoidosis produces hypercalcemia by increasing the conversion of 25-hydroxyvitamin D to 1 ,25-hydroxyvitamin D in the granulomatous tissue. Hematologic malignancies can also cause hypercalcemia due to the increased conversion of 25-hydroxyvitamin D to 1,25-dihydroxyvitamin D. This patient does not have sarcoidosis because his 1 ,25-dihydroxyvitamin D level is normal.

6. Question

1 points

A 23-year-old man presents to your office complaining of occasional headaches, muscle weakness and fatigue. He also describes periodic numbness of his extremities. The symptoms started 6 months ago and have gradually progressed. His past medical history is insignificant. He is not taking any medication. His blood pressure is 165/104 mm Hg and heart rate is 80/min. His physical examination is within normal limits. Which of the following laboratory findings is the most specific for the patient's condition?

1. Low serum potassium level
2. High serum sodium level
3. Metabolic alkalosis
4. Low plasma renin activity
5. High aldosterone/renin ratio ✔

INCORRECT ✖

The correct answer is 5.

A young patient with hypertension, muscle weakness and numbness should make you think of primary hyperaldosteronism. This condition is usually caused by an aldosterone-secreting adrenal tumor. When there is an aldosterone excess in the body, this causes an increased renal sodium reabsorption with resultant hypertension. Aldosterone also increases renal potassium loss with resultant muscle weakness and numbness. The most specific

laboratory value for this condition is increased aldosterone/renin ratio, because an increased aldosterone level suppresses renin secretion. At the same time, measurement of plasma renin activity alone **(Choice 4)** may give a value that overlaps with low-normal values, but aldosterone/renin ratio is almost always elevated.
(Choices 1 & 2) Low serum potassium and high serum sodium levels can help you arrive at the correct diagnosis, but they are not specific for the disease, and may be normal in mild forms of primary hyperaldosteronism.
(Choice 3) is caused by the increase in aldosterone-induced renal reabsorption of bicarbonate, but this finding is highly non-specific.

7. Question

1 points

A 63-year-old otherwise healthy male presents with a thyroid nodule. He denies any symptoms of anxiety, heat or cold intolerance, and recent changes in appetite or weight. He has hypertension, which is being treated with a β-blocker. He does not have any other medical problems. He denies any family history of thyroid disease. His pulse is 79/min and blood pressure is 130/76 mmHg. Neck examination shows a hard, fixed, non-tender, 4 cm thyroid nodule in the right thyroid lobe. His serum TSH level is normal. Fine needle aspiration biopsy (FNAB) shows follicular cells. Follicular carcinoma is suspected. Which of the following is necessary to make a diagnosis of follicular thyroid cancer?

1. Lymph node involvement
2. Invasion of the tumor capsule and blood vessels ✔
3. Secretion of calcitonin
4. Presence of Hurthle cells on biopsy
5. Presence of psammoma bodies

INCORRECT ✖
The correct answer is 2.
Follicular thyroid cancers have an early hematogenous spread to the lung, brain and bone. Histopathologically, demonstration of invasion of the capsule and blood vessels is required for differentiating follicular cancers from follicular adenomas. FNAB often shows large numbers of normal-appearing follicular cells, which is commonly labeled as “follicular neoplasm”; however, it may be difficult (and even impossible) to differentiate follicular cancers from adenoma using FNAB. Unlike papillary cancer, follicular cancer is encapsulated, and does not have distinctive nuclear features.
(Choice 1) In contrast to papillary thyroid cancer, local lymph node involvement is rare in follicular cancer.

(Choice CJ Secretion of calcitonin is a feature of medullary cancer of the thyroid.
(Choice 4) Hurthle cells can be seen in the histology of both follicular and papillary cancers. Hurthle cell carcinoma is a variant of follicular cell carcinoma.
(Choice 5) Papillary thyroid cancer (PTC) is the most common thyroid malignancy. It is characterized by a slow, infiltrative local spread affecting other parts of the thyroid gland and regional lymph nodes. The presence of psammoma bodies are a characteristic histopathological feature. FNAB typically reveals large cells with ground glass cytoplasm, and pale nuclei with inclusion bodies and central grooving. In contrast to follicular thyroid cancer which is encapsulated, PTC is un-encapsulated. The prognosis of patients with PTC is excellent, even in the presence of metastasis.

8. Question

1 points

A 38-year-old female presents to the office complaining of lethargy, weight gain and fatigue. She denies headaches, pruritus or urine discoloration. She just gave birth 2 months ago via vaginal delivery; her baby is in good health and receives formula nutrition. Her delivery was complicated by vaginal bleeding that required blood transfusion, and postpartum endometritis that rapidly responded to antibiotics. She has not had any menstrual periods following delivery. Physical examination shows sparse pubic hair, dry skin and delayed tendon reflexes. Urinalysis shows no glucose or ketones. Which of the following is most likely to be responsible for this patient's condition?

1. Infiltrative disorder
2. Autoimmune tissue destruction
3. Ischemic necrosis ✔
4. Drug effect
5. Neoplasia

INCORRECT ✖
The correct answer is 3.
In this patient, lactation failure cannot be ruled out since her child is formula feeding; hence, prolactin deficiency is possible. Furthermore, she has features of hypogonadism and hypothyroidism. Her presentation is thus very suggestive of hypopituitarism following pregnancy. The two most common causes of hypopituitarism in the postpartum period are Sheehan's syndrome and lymphocytic hypophysitis. Sheehan's syndrome develops due to ischemic necrosis of the pituitary gland (sometimes even the hypothalamic nuclei) because of peri-partum bleeding.

(Choice 1) Another possible cause of hypopituitarism is an infiltrative disorder such as sarcoidosis; however, patients with such conditions do not present in the postpartum period. Diabetes insipidus more commonly occurs with infiltrative disorders than pituitary tumors. Overt diabetes insipidus is uncommon in Sheehan's syndrome.
(Choices 2 & 5) Lymphocytic hypophysitis is less common than Sheehan's syndrome, and is not related to peri-partum hemorrhage. Patients typically present with headaches, visual disturbances and pituitary failure. Differentiation of lymphocytic hypophysitis from a pituitary neoplasm is sometimes difficult.

9. Question

1 points

A 56-year-old woman presents to the clinic with a 7-month history of headache and visual disturbance. Her past medical history is unremarkable. She is currently not taking any medications. She admits to smoking a pack of cigarettes daily for the last 15-years, and does not drink. On visual field examination, there is a small field defect noted in both eyes. MRI scan shows a pituitary tumor. Which of the following is the most common type of pituitary tumor?

1. Thyrotroph adenoma
2. Gonadotroph adenoma
3. Corticotroph adenoma
4. Lactotroph adenoma ✔
5. Somatotroph adenoma

INCORRECT ✖
The correct answer is 4.
Lactotroph adenoma (prolactinoma) is the most common pituitary tumor. It accounts for approximately 50% of primary pituitary tumors. Functional lactotroph adenoma produces prolactin, and patients present with hypogonadism and galactorrhea. Other less common primary pituitary tumors include somatotroph adenoma, corticotroph adenoma, thyrotroph adenoma, gonadotroph adenoma and craniopharyngioma. Due to a rich blood supply, metastasis from cancer (particularly the lung and breast) can also involve the pituitary.
(Choices 1 & 2) Thyrotroph and gonadotroph adenomas are less common. Functional thyrotroph adenoma produces TSH, and patients present with hyperthyroidism. Functional gonadotroph adenoma produces LH and FSH, and patients present with mass effects and hypopituitarism.
Approximately 10% of primary pituitary tumors do not produce any hormone (non-functional). Many of these non-functional primary pituitary tumors are gonadotroph adenomas, which sometimes produce only the alpha subunit of gonadotrophins. Patients with non-functioning

pituitary tumors also present with mass effect and hypopituitarism.
(Choice 3) ACTH secreting-corticotroph adenoma accounts for 10% of primary pituitary tumors. Functional corticotroph adenoma produces ACTH, and patients present with Cushing's disease.
(Choice 5) Growth hormone-secreting somatotroph adenoma accounts for 20% of primary pituitary tumors. Functional somatotroph adenoma produces growth hormone, and patients present with acromegaly or gigantism.

10. Question **1 points**

A 65-year-old Hispanic male comes to the office for a routine medical checkup. He has a history of diabetes for the past twenty years, and hypertension for the past ten years. His daily medications include insulin and ramipril. He was diagnosed with nonproliferative diabetic retinopathy at his last ophthalmologic visit. Reports from his previous laboratory studies show microalbuminuria. A detailed neurological examination is performed to check for any neuropathy. Which of the following is the most common type of neuropathy found in diabetics?

1. Proximal motor neuropathy
2. Autonomic neuropathy
3. Mononeuropathy multiplex
4. Symmetrical distal polyneuropathy ✔
5. Mononeuropathy

INCORRECT ✖
The correct answer is 4.
Neuropathy is seen in approximately 50% of patients with long-standing diabetes mellitus (DM). Its occurrence is related to the duration of disease and level of glycemic control. Tight glycemic control is associated with a significant reduction of development of neuropathy in both type 1 and type 2 diabetes. Furthermore, a recent study has shown that the risk of diabetic neuropathy increases significantly in patients with risk factors for atherosclerosis (i.e., dyslipidemia, hypertension, smoking, obesity).
Patients may manifest with distal symmetrical sensorimotor polyneuropathy, proximal neuropathy, mononeuropathy and/or autonomic neuropathy. Among these, symmetrical distal sensorimotor polyneuropathy is the most common neuropathy and patients present with the classic "stocking glove" pattern of sensory loss. The type of sensory involvement depends on the type of nerve fibers involved. Pure small fiber neuropathy is characterized by more pain, allodynia and paresthesias; sensory loss is not marked, and ankle jerks may be

preserved. Pure large fiber neuropathy is characterized by less pain, but more numbness. Pressure, proprioception and vibratory sensations are decreased; ankle jerks are usually lost.
(Choice 1) Occasionally, older males develop symmetrical, proximal, predominantly motor neuropathy, thereby causing weakness of the hip muscles. Differentiation from primary muscle disorder requires nerve conduction studies.
(Choice 2) Diabetic autonomic neuropathy involves the cardiovascular, genitourinary and gastrointestinal systems. Some of the most commonly encountered problems are gastroparesis, enteropathy, postural hypotension, abnormal sweating, cytopathy and erectile dysfunction.
(Choice 3) As its name suggests, mononeuropathy multiplex occurs when the patient experiences multiple mono neuropathies, thus presenting as an asymmetric polyneuropathy.
(Choice 5) Mononeuropathies may be cranial (most commonly involving CN 3, 4 and 6) or peripheral (most commonly involving the radial, peroneal and median nerves). The etiology of mononeuropathy is mainly vascular, and recovery is usually seen in a few months time. For unknown reasons, patients with diabetes are predisposed to pressure palsies.

11. Question

1 points

A 46-year-old male comes to your office for a routine health examination. He has no current physical complaints and says he is compliant with his medications. His past medical history is significant for type 2 diabetes diagnosed two years ago that he has been able to control with diet, exercise and metformin. The patient also takes a daily aspirin. On physical examination, he has a temperature of 36.7°C (98°F), a blood pressure of 140/86 mm Hg, a pulse of 80/min, and respirations of 14/min. His laboratory studies show:

Total cholesterol: 170 mg/dl
High density lipoprotein (HDL): 50 mg/dl
Low density lipoprotein (LDL): 65 mg/dl
Triglycerides (TG): 150 mg/dl
HbA1C: 7.0

Serum chemistries are within normal limits. Which of the following is the most appropriate next step in the management of this patient?

1. Add niacin
2. Add gemfibrozil
3. Add lisinopril ✔
4. Add ezetimibe
5. Add insulin

INCORRECT ✖

The correct answer is 3.

This type 2 diabetic has had relatively good control of his blood glucose over the past 2-3 months, as evidenced by his HbA1C value. Additionally, his lipid profile meets current guidelines for diabetic patients (LDL<100mg/dl). However, the patient's blood pressure is high. Tight blood pressure control in diabetics has been shown to delay the development of cardiovascular disease and renal failure. Current guidelines recommend a target blood pressure of 30 mg/g.

(Choices 1 & 2) There are no strict Adult Treatment Panel III (ATP III) guidelines for the management of low HDL or high TG levels. However, most physicians treat HDL levels< 35 with a goal of 40 mg/dl in men and 50 mg/dl in women. TG levels greater than 200-400 mg/dl also require therapy in most patients.

12. Question **1 points**

A 60-year-old white male is hospitalized due to an acute myocardial infarction. His other medical problems include type 2 diabetes mellitus, hypertension, chronic obstructive pulmonary disease, and degenerative joint disease. He admits to smoking 2 packs of cigarettes daily for the past 20 years, as well as drinking 2 bottles of beer daily for the past 15 years. His medications include aspirin, glyburide, metoprolol, enalapril, heparin, and albuterol and ipratropium inhalers. His blood pressure is 140/80 mm Hg, pulse is 80/min, respirations are 16/min, and temperature is 36.7C (98.0F). During his stay in the hospital, a number of blood tests were ordered. Which of the following lab abnormalities is an indication for thyroid function testing?

1. Hyperlipidemia ✔
2. Unexplained hypocalcemia
3. Unexplained hypernatremia
4. Thrombocytopenia
5. Neutropenia

INCORRECT ✖

The correct answer is 1.

Hyperlipidemia is an indication for thyroid function testing because it occurs with increased frequency in hypothyroid patients. The most frequently seen lipid abnormality in hypothyroid patients is hypercholesterolemia (increased LDL), although hypercholesterolemia combined with hypertriglyceridemia can sometimes occur. Isolated hypertriglyceridemia is uncommon. One of the major causes of increased serum LDL concentration is decreased clearance due

to decreased LDL receptors. Lipid abnormalities may take months to resolve despite adequate treatment of hypothyroidism. Caution must be exercised in patients with poorly-controlled hypothyroidism because these patients have an increased risk of myopathy with statin use.
(Choice 3) Unexplained hyponatremia is an indication for thyroid function testing because it may occur in hypothyroid patients due to inappropriate ADH secretion. Hypernatremia is not seen in hypothyroid patients.
(Choices 2, 4 & 5) Hypocalcemia, thrombocytopenia and neutropenia are not seen in hypothyroid patients.
Other indications for performing thyroid function tests are high serum muscle enzymes (myopathy) and anemia. Patients with hypothyroidism may have asymptomatic elevation of serum muscle enzymes. The most common anemia in hypothyroid patients is normocytic, normochromic. Patients with chronic autoimmune thyroiditis may have pernicious anemia. Women of reproductive age may develop iron deficiency anemia secondary to menorrhagia.

13. Question

1 points

A 27-year-old woman presents to the office due to a significant amount of hair on her cheeks, chin and upper lips. This symptom developed over the past two months. Her last menstrual period was 12 weeks ago, but she did not seek medical help because her home pregnancy test was negative. Her medical history is unremarkable. She denies taking any medications other than oral contraceptive pills. Physical examination reveals acne on the forehead and cheeks; there is terminal hair on the upper lip, cheeks, chin, upper chest and lower abdomen. Examination of the genitals shows clitoromegaly. The abdominal exam is normal; the uterus is normal in size. Ultrasound reveals a normal uterus and ovaries, but there is a left adrenal mass. Which of the following measurements is most specific for this patient's condition?

1. Luteinizing hormone (LH)
2. Adrenocorticotropic hormone (ACTH)
3. Testosterone
4. Androstenedione
5. Dihydrotestosterone
6. Dehydroepiandrosterone-sulfate ✔

INCORRECT ✖
The correct answer is 6.
Women produce androgens, such as androstenedione (AS), dehydroepiandrosterone (DHEA), testosterone (T) and dehydroepiandrosterone sulfate (DHEA-S). AS, DHEA and

Tare produced by the ovaries and adrenals, whereas DHEA-S is predominantly produced in the adrenal glands only. AS, DHEA and DHEA-S are not true androgens because they do not interact with the androgen receptor. They can be converted to testosterone, and overproduction of these hormones can lead to clinical features of androgen excess (as in this patient).
(Choice 2) An increase in ACTH levels in patients with hirsutism are seen in patients with ectopic or pituitary-dependent Cushing's disease. ACTH increases the production of cortisol, as well as androgens from the adrenal glands; however, the adrenal glands show diffuse hyperplasia rather than a discrete adenoma.
(Choices 3 & 4) Testosterone and androstenedione levels may be elevated in both adrenal and ovarian tumors.
(Choice 5) Dihydrotestosterone is the product of the testosterone conversion in peripheral tissues by 5-α-reductase. It is a potent androgen and interacts with the testosterone receptors. Increased dihydrotestosterone levels are not specific for androgen-producing adrenal tumors.

14. Question

1 points

A 35-year-old white female presents with complaints of weight gain, lethargy and constipation for the last 2 months. She also complains of cold intolerance and oligomenorrhea. She is not taking any medication. She is a non-smoker, and does not drink alcohol. Her pulse is 67/min, and blood pressure is 130/90 mm Hg. She is afebrile. Her hands are dry and cold. There is a non-tender, diffuse rubbery enlargement of the thyroid gland without any discrete nodularity. She does not have exophthalmos, lid lag or lid retraction. Labs show decreased serum T4 levels, elevated serum TSH levels and positive anti-thyroperoxidase (TPO) antibodies. Which of the following complications may develop in this patient?

1. Lymphoma of the thyroid ✔
2. Papillary carcinoma of the thyroid
3. Follicular carcinoma of the thyroid
4. Anaplastic carcinoma of the thyroid
5. Medullary carcinoma of the thyroid

INCORRECT ✖
The correct answer is 1.
The above patient has Hashimoto's thyroiditis. Patients with this disorder may be euthyroid or hypothyroid. Transient thyrotoxicosis can occur rarely during the initial part of the illness

due to the presence of thyroid stimulating antibodies, or the release of thyroid hormones from inflammation. Although Hashimoto's thyroiditis is a histological diagnosis, positive anti-thyroperoxidase (TPO) antibodies with an enlarged rubbery goiter are virtually diagnostic. The risk of thyroid lymphoma is about 60 times higher in patients with Hashimoto's thyroiditis compared to patients without thyroiditis. The typical presentation is rapid enlargement of the thyroid gland in patients with preexisting Hashimoto's thyroiditis. Compressive symptoms (e.g., dysphagia, voice change) are common. CT scan of the neck shows enlargement of the thyroid gland around the trachea; this is also known as the 'doughnut sign.' Thyroid ultrasound shows a characteristic pseudo cystic pattern. The radioactive iodine uptake is reduced. Fine needle aspiration biopsy may miss the diagnosis; therefore, core biopsy is often required for making a diagnosis.
(Choices 2, 3, 4 & 5) Thyroid cancer of epithelial cell origin (i.e., follicular, papillary and anaplastic) or C-cell origin (i.e., medullary) does not occur with increased frequency in patients with Hashimoto's thyroiditis.

15. Question

1 points

A 16-year-old female presents to the office with her mother and complains of changes in her physical appearance over the past year. She first noted the appearance of dark hair on the cheeks, upper lips, around the nipples and umbilicus. Her menstrual cycles have always been irregular since her menarche at age 14. Her medical history is otherwise unremarkable. She denies taking any medications. She has a boyfriend, but claims that she is still not sexually active. Her blood pressure is 115/65 mm Hg, pulse is 80/min, respirations are 16/min, and temperature is 37 C (98F). Pelvic examination could not be performed, and abdominal examination is normal. Ultrasound is normal. Results of the initial work-up are as follows:

Serum Na+: 140 mEq/L
Serum K+: 4.0 mEq/L
Serum Cl-: 98 mEq/L
Bicarbonate: 25 mEq/L
17-α-hydroxyprogesterone: elevated

According to these findings, which of the following hormone deficiencies does this patient most likely have?

1. 17-α-hydroxylase-deficiency
2. 21-hydroxylase-deficiency ✔
3. 11-β-hydroxylase-deficiency
4. 3-β-hydroxysteroid-dehydrogenase deficiency
5. Cystathionine synthase deficiency

INCORRECT ✖

The correct answer is 2.

Congenital adrenal hyperplasia (CAH) describes a group of autosomal recessive disorders which result in the deficiency of one of the five enzymes responsible for cortisol biosynthesis in the adrenal glands. The resultant low plasma cortisol level stimulates the pituitary to increase the production of ACTH; however, metabolites proximal to the dysfunctional enzyme accumulate. The most common form of CAH is 21-hydroxylase deficiency, accounting for more than 90% of cases. The metabolite that accumulates in 21-hydroxylase deficiency is 17-α-hydroxyprogesterone. Elevated levels of 17-α-hydroxyprogesterone serve as precursors of adrenal androgens, thereby leading to hyperandrogenism.

Complete deficiency of 21 hydroxylase presents at birth with virilization of the female child and excessive androgenization of the male child; there is also a decreased production of mineralocorticoids and glucocorticoids, which causes salt wasting. Partial deficiency is also known as non-classical CAH; patients usually present during puberty or adulthood with hyperandrogenism, which is not usually associated with salt wasting. The diagnosis is suggested by increased levels of 17-α-hydroxyprogesterone, and confirmed with an ACTH stimulation test.

(Choices 1, 3 & 4) Other deficiencies leading to CAH include

1 . 17 hydroxylase deficiency: leads to delayed puberty and mineralocorticoid excess

2. 11-β-hydroxylase deficiency: results in androgen and mineralocorticoid excess

3. 3-β-hydroxysteroid dehydrogenase deficiency: results in DHEA-S excess and decreased testosterone and mineralocorticoids

(Choice 5) Cystathionine synthase deficiency or homocystinuria is characterized by Marfan body habitus, dislocation of the lenses, fair skin and vascular thrombosis.

16. Question

1 points

A 21-year-old man with type 1 diabetes mellitus presents to the emergency department with complaints of abdominal pain, nausea and vomiting. His temperature is 36.0C (97.0F), pulse is 110/min, blood pressure is 102/60 mm Hg, and respirations are 26/min. Lungs are clear to auscultation. Abdomen is soft, non-tender and non-distended. Chemistry panel shows:

Sodium: 130 mEq/L
Potassium: 5.2 mEq/L
Chloride: 90 mEq/L
Bicarbonate: 10 mEq/L
Blood glucose: 450 mg/dl

Which of the following is the most appropriate next step in management?

1. Normal saline and regular insulin ✔
2. 0 .45% saline and regular insulin

3. Normal saline and NPH insulin
4. 5% dextrose and NPH insulin
5. Sodium bicarbonate

INCORRECT ✖

The correct answer is 1.

The clinical picture described in the vignette is consistent with diabetic ketoacidosis (OKA). He has elevated anion gap (130-(90+10) and acidosis (low bicarbonate). The main precipitating factor in such cases is omission of insulin with or without infection or other stressors. OKA primarily occurs in patients with type 1 diabetes mellitus, especially since such patients do not have insulin of their own and require insulin treatment for survival. For making a diagnosis of OKA, three things are necessary: blood glucose level >250 mg/dl, pH< 7.3 or low serum bicarbonate(< 15- 20 mmol/L), and detection of plasma ketones. The most appropriate initial management is rapid, intravenous administration of normal saline and regular insulin.

Essential measures in the management of OKA include the following:

1. restoration of intravascular volume: using 0 .9% saline (normal saline)
2. correction of hyperglycemia: using intravenous regular insulin
3. correction of electrolyte abnormalities: Potassium correction is very crucial.
4. treatment of precipitating factors such as infections: using antibiotics

(Choices 2 & 4) 0.45% saline is not appropriate as an initial IV fluid when the patient is hypotensive; however, the infusion of normal saline is changed to 05% in 0.45% saline with potassium once the blood glucose level reaches 200-250 mg/dl.

(Choice 3) NPH insulin is not appropriate for the initial treatment of OKA due to its delayed onset and prolonged action. NPH insulin is generally started when patients recover from OKA and begin to tolerate oral feeding.

(Choice 5) The administration of bicarbonate to correct acidosis in all patients with OKA is usually not required due to its many associated adverse effects. Bicarbonate use can cause cerebral edema, particularly in children. It can shift the oxygen dissociation curve to the left, thus decreasing tissue oxygenation. It can also lead to hypokalemia and alkalosis. Bicarbonate administration is thus reserved for OKA patients with severe acidosis (pH less than or equal to 7 .1), plasma bicarbonate < 5 mEq/L, or severe hyperkalemia.

17. Question **1 points**

A 40-year-old female patient is brought to the office by her husband due to altered mental status and confusion of recent onset. According to her husband, she has been complaining of intense thirst, craving for ice water, and experiencing increased urination for the past few days. Her only

medication is lithium for bipolar depression. Her temperature is 39.0 C (102.5 F), pulse is 102/min, blood pressure is 90/60 mm Hg, and respirations are 15/min. Physical examination reveals a disoriented patient with dry skin and mucous membranes. Blood chemistry panel reveals:

Sodium: 156 mEq/L
Potassium: 4.1 mEq/L
Bicarbonate: 26 mEq/L
Blood glucose: 102 mg/dl
BUN: 27 mg/dl

Serum osmolality is 328 mOsm/kg, and urine osmolality is 180 mOsm/Kg. What is the most appropriate next step in the management of this patient?

1. Water deprivation test
2. Plain water drinking
3. IV infusion of normal saline ✔
4. IV infusion of 045 % saline
5. IV infusion of 5% dextrose

INCORRECT ✖

The correct answer is 3.

This patient is suffering from nephrogenic diabetes insipidus (DI), which is most likely due to lithium therapy. DI presents as polyuria and polydipsia due to anti-diuretic hormone (ADH) deficiency or resistance. Patients are typically polydipsic and prefer cold beverages. They characteristically excrete dilute urine in the presence of increased plasma osmolality. Furthermore, water deprivation in these patients generally leads to excessive fluid loss dehydration and increased plasma osmolality, thereby leading to central nervous system dysfunction.

Lithium-induced DI occurs when lithium accumulation in the kidneys directly damages the renal tubules. In such cases, amiloride is the preferred therapeutic agent because it prevents further lithium accumulation in the renal tubules. In the presence of CNS dysfunction and significant dehydration (as in this patient), intravenous fluid therapy is also recommended as part of the management. Normal saline is the best initial intravenous fluid of choice for any patient with gross intravascular fluid deficits and hypotension.

(Choice 1) Water deprivation test is used to differentiate between psychogenic polydipsia and DI. Fluid restriction produces plasma hyperosmolality. The normal reaction to plasma hyperosmolality is the production of maximally concentrated urine (urine hyperosmolality); this is seen in patients with psychogenic polydipsia. In patients with DI, the urine continues to be dilute (low osmolality) despite high plasma osmolality; therefore, plasma hyperosmolality with urine hyposmolality is suggestive of DI. The administration of ADH during the water

deprivation test is used to distinguish between nephrogenic and central DI; if there is no increase in urine osmolality (ADH resistance) following ADH injection, nephrogenic DI is more likely.
Water deprivation should not be performed when a patient is hypovolemic; therefore, this is not appropriate for the patient in this vignette.
(Choice 2) Most patients with DI can maintain normal extravascular volume and osmolality by drinking excessive amounts of water and fluids; however, the patient in this vignette is in a hypovolemic, hyperosmolar state with CNS symptoms. Plain water drinking is not appropriate in this setting.
(Choices 4 & 5) Once the intravascular volume improves, the water deficit can be corrected with hypotonic fluids (0.45% saline or D5%W). In patients without hypotension, hypotonic intravenous fluids can be started as an initial therapy.

18. Question

1 points

A 60-year-old male presents to your office complaining of decreased hearing on the right side. He also feels that something is wrong with his head because his hat size had increased over the last two years. His past medical history is significant for hypertension and peptic ulcer disease. His current medications are hydrochlorothiazide and enalapril. He also takes ibuprofen for occasional headaches, and ranitidine for infrequent episodes of heartburn. Lab tests showed increased alkaline phosphatase levels. Which of the following is the most likely mechanism underlying this patient's condition?

1. Increased osteoid deposition
2. Bone demineralization
3. Abnormal bone remodeling ✔
4. Fibrous replacement of the bone
5. Abundant mineralization of the periosteum

INCORRECT ✖
The correct answer is 3.
Prevalence studies indicate that 2-3 % of the population over 40 years of age may be affected by Paget's disease. Patients are often asymptomatic; however, those with symptoms usually first note an increase in hat size, which is indicative of asymmetric enlargement of the cranium. In patients with cranial enlargement, hearing loss is a common complication. This hearing loss correlates with loss of bone mineral density in the cochlear capsule. In this case, the patient's presentation (i.e., hearing loss, increased hat size, and occasional headaches) is very suggestive of Paget's disease.

The primary defect in Paget's disease is abnormal bone remodeling. Initially, there is a localized excess of osteoclastic bone resorption, in which there are usually increased numbers of larger than normal osteoclasts at the involved sites. With progression of osteoclastic activity, activation of the osteoblasts and immature bone deposition occurs. Activation of the osteoclasts and osteoblasts leads to transformation of normal lamellar and woven bone into a chaotic "mosaic" pattern of irregularly juxtaposed pieces of lamellar bone, interspersed with woven bone. In some cases, the disease eventually gets burned out, in which the abnormal matrix persists, but cellular activity is nearly absent. The exact cause of the disorder is unclear, but several workers have shown evidence of viral etiology in Paget's disease. Radiologic and histologic evidence of increased bone turnover (resorption and formation) can be readily assessed by measuring the biochemical markers of bone turnover. In general, the following tests accurately reflect the extent and activity of the disease:

1. Alkaline phosphatase – marker of bone formation; it is elevated in patients with Paget's disease, and is most commonly used to assess the activity of disease, as well as response to treatment.
2. Urinary n telopeptide – most commonly used as a marker of bone resorption.

(Choice 1) Increased deposition of unmineralized osteoid is observed with vitamin D deficiency.
(Choice 2) Bone demineralization is typical for osteoporosis and hyperparathyroidism.
(Choice 4) Fibrous replacement of the bone is seen with fibrous dysplasia.
(Choice 5) Abundant mineralization of the periosteum can be observed during hypervitaminosis A.

19. Question

1 points

A 40-year-old asymptomatic male comes to the office for a routine physical examination. His serum chemistry panel shows:

Sodium: 140 mEq/L
Potassium: 4.0 mEq/L
Bicarbonate: 25 mEq/L
Chloride: 101 mEq/L
Calcium: 11.8 mg/dL
Albumin: 4.0 g/dL
Phosphorus: 2.2 mg/dL

24-hour urine collection reveals a calcium level of 200 mg, and creatinine level of 1 .7 g. Serum PTH level is increased. Bone mineral density by dual energy X-ray absorptiometry (DEXA) shows normal bone mineral density. Neck examination reveals no masses. What is the most appropriate next step in the management of this patient?

1. Bisphosphonate therapy
2. Surgical exploration of the neck ✔

3. Medical surveillance
4. Loop diuretics
5. Thiazide diuretics

INCORRECT ✖

The correct answer is 2.

The patient most likely has asymptomatic primary hyperparathyroidism. Laboratory findings of hypercalcemia, hypophosphatemia and elevated PTH levels are very suggestive of the diagnosis. Asymptomatic primary hyperparathyroidism is a common disorder, particularly in females over 60 years of age. Most patients are usually identified during routine chemistry screening (as in this case). While surgical intervention (i.e., parathyroidectomy) is needed for all patients with symptomatic primary hyperparathyroidism, not all asymptomatic patients require such treatment. The indication for surgery in asymptomatic patients is the presence of at least one of the following features:

1. Serum calcium level at least 1 mg/dL above the upper limit of normal
2. Urinary calcium excretion greater than 400mg/24hr
3. Young age (< 50 years old)
4. Bone mineral density (BMD) lower than T-2.5 at any site
5. Reduced renal function (eGFR < 60 ml/min)

This patient has a grossly elevated calcium level (i.e., greater than 1 mg/dL above the upper normal limit) and is less than 50 years of age; therefore, surgical intervention is indicated.

(Choice 2) If the abovementioned criteria for surgery are not met, conservative treatment is advocated. Patients are monitored with serum calcium levels every six months, and serum creatinine levels and bone mineral density every year. Approximately 80-90% of patients with mild primary hyperparathyroidism does not show any sign of disease progression on follow-up.

(Choices 1 & 4) Bisphosphonate therapy and loop diuretics are used for the treatment of symptomatic hypercalcemia. Longterm bisphosphonate therapy in patients with asymptomatic hyperparathyroidism leads to an increased bone mineral density, and may be used in some patients who refuse surgery. Nonetheless, safety data for longterm use of bisphosphonates in primary hyperparathyroidism are unknown.

(Choice 3) Medical surveillance is appropriate in older, asymptomatic patients with near normal calcium levels, 24-hour urinary calcium levels less than 400 mg, and normal bone density.

(Choice 5) Thiazide diuretics are likely to worsen hypercalcemia, and should therefore be avoided.

20. Question **1 points**

A 37-year-old white female presents with galactorrhea and amenorrhea for the past 7 months. She denies any headaches, visual problems, vaginal dryness or dyspareunia. She is married, has two children, and remarks that her family is “complete.” She does not use tobacco, alcohol or drugs. Her blood pressure is 120/80 mmHg, pulse is 72/min, temperature is 36’7C (98F) and respirations are 14/min. Visual field testing is within normal limits. Pregnancy test is negative. Her serum prolactin level is 150 ng/ml. Pituitary MRI shows a 6 mm pituitary adenoma. Which of the following is the most appropriate next step in the management of this patient?

1. Surgery
2. Treatment with cabergoline ✔
3. Treatment with estrogens
4. Radiotherapy
5. Monitoring by serum prolactin and MRI

INCORRECT ✖

The correct answer is 2.

A pituitary tumor less than 10 mm in diameter is called a microadenoma. Microprolactinoma is a prolactin-secreting microadenoma, and is one of the most common pituitary tumors encountered in clinical practice. Microprolactinoma classically presents as amenorrhea and galactorrhea in females (as in this patient), and as hypogonadism in males. Due to its small size, this microadenoma usually does not cause problems with other pituitary hormones or a mass effect.

The primary treatment for all prolactinomas (both micro- as well as macroprolactinoma) is medical treatment with dopaminergic agents (e.g., bromocriptine and cabergoline). Medical treatment not only results in normalization of prolactin levels, but leads to significant reduction in tumor size. Cabergoline is a new drug which has fewer side effects, and has been shown to be more effective than bromocriptine.

(Choice 1) Surgery is reserved only for those patients who do not respond to or do not tolerate treatment with a dopamine agonist. Surgery is also indicated when impaired vision due to invasive prolactinoma does not rapidly improve after drug treatment.

(Choice 3) Estrogen replacement therapy may be given to selected hypoestrogenic females with microprolactinoma (e.g., patients who are intolerable to or experience side effects from the use of bromocriptine and cabergoline). Treatment is required in such cases because low estrogen levels can predispose these patients to osteoporosis. Studies have shown that estrogen replacement therapy does not increase the size of microprolactinoma.

(Choice 4) Radiotherapy may be indicated for aggressive tumors that do not respond to medical and surgical therapy. The response to radiotherapy is generally delayed, and there is a risk of development of panhypopituitarism.

(Choice 5) Tumor growth in most patients with microprolactinoma is very slow; therefore, observation can be chosen for asymptomatic patients with microprolactinoma.

21. Question **1 points**

A 35-year-old white male presents with fatigue, decreased appetite, weight gain, constipation and cold intolerance. He cannot recall any stressful event. He does not take any medications. He is a non-smoker and non-alcoholic. His pulse is 47/min and blood pressure is 145/91 mm Hg. Physical examination reveals cool, pale skin, coarse hair, and brittle nails. There is delayed relaxation of deep tendon reflexes. The thyroid gland is normal on palpation. Laboratory studies reveal increased serum free T3 and T4 levels, and normal serum TSH level. Which of the following is the most likely diagnosis?

1. Primary hypothyroidism
2. Secondary hypothyroidism
3. Subclinical hypothyroidism
4. Generalized resistance to thyroid hormones ✔
5. Graves' disease

INCORRECT ✖

The correct answer is 4.

Hypothyroidism can result from diseases of the thyroid gland (primary hypothyroidism), pituitary gland (secondary hypothyroidism) and hypothalamus (tertiary hypothyroidism). Rarely, resistance to the action of thyroid hormones may cause hypothyroidism. Generalized resistance to thyroid hormones result from receptor defects on the peripheral tissues. Patients usually present at an early age with growth and mental retardation; however, patients with milder defects can present later in life. Elevated circulating thyroid hormone levels with normal to elevated TSH levels are characteristic. Patients typically present with hypothyroidism despite having elevated circulating thyroid hormone levels.

(Choice 1) Primary hypothyroidism is characterized by low circulating levels of thyroid hormones with TSH levels of more than 10 IU/L. Among all the causes of hypothyroidism, primary hypothyroidism from autoimmune thyroid disease is the most common.

(Choice 2) Secondary and tertiary hypothyroidism is characterized by low circulating thyroid hormone levels with low or inappropriately normal TSH levels.

(Choice 3) Subclinical hypothyroidism is characterized by mildly elevated serum TSH levels and normal circulating thyroid hormone levels. Patients do not have clinical features of overt hypothyroidism.

(Choice 5) Graves' disease is characterized by elevated T3 and T4 levels with very low TSH levels. Patients have symptoms and signs of hyperthyroidism.

22. Question **1 points**

A 36-year-old white female comes to the office due to swelling in front of her neck. She denies any hoarseness, dysphagia, fever, chills, diarrhea, constipation, heat or cold intolerance, and changes in appetite or weight. Her menstrual cycles are regular. She does not have any history of head and neck irradiation. Her family history is negative for thyroid problems. Her blood pressure is 130/80 mm Hg, pulse is 80/min, respirations are 16/min, and temperature is 36.7C (98.0F). Examination of the neck shows a 2 x 2 cm, discrete, non-tender, firm, mobile nodule in the left thyroid lobe. There is no cervical lymphadenopathy. The rest of the examination is normal. Which of the following is the most appropriate next step in the evaluation of this patient?

1. Measurement of TSH ✔
2. Measurement of free T4 and anti-thyroid antibodies
3. Radionuclide scans with iodine 131
4. Fine needle aspiration biopsy
5. Ultrasound of the thyroid gland

INCORRECT ✖

The correct answer is 1.

The first step in the evaluation of a patient with a thyroid nodule is measurement of the thyroid stimulating hormone (TSH) level. Subsequent steps are dependent on the TSH levels.

(Choice 2) If the TSH level is elevated, the levels of thyroid antibodies and thyroxine (T4) are measured because patients with Hashimoto's thyroiditis can have thyroid nodule formation. Since thyroid cancer can occur with Hashimoto's thyroiditis, FNAB is usually done if the nodule is larger than 1-1.5cm. There is no real pathognomic sign that can conclusively differentiate benign from malignant thyroid nodules; however, a rapid decrease in nodule size with levothyroxine treatment is very reassuring for a benign process.

(Choice 3) If the TSH level is suppressed or below normal, radioiodine uptake and scan are typically performed. If the scan shows a hot nodule (increased uptake of the tracer in the nodule with decreased uptake in rest of the thyroid gland), FNAB is not performed because the chances of malignancy in a hot nodule are extremely low.

(Choice 4) If the TSH level is normal, fine needle aspiration biopsy (FNAB) is the next step.

(Choice 5) Ultrasound is a very sensitive tool for identifying thyroid nodules; however, its use is not immediately required when the nodule is palpable. It may be used for guiding the FNAB (especially if the nodule is non-palpable) and for following nodule growth.

23. Question **1 points**

A 65-year-old diabetic male with acute myocardial infarction complicated by cardiogenic shock is admitted in the coronary care unit. His hospital course was complicated by acute renal failure and lower GI bleeding from anticoagulation therapy. His thyroid hormone studies are abnormal. He does not have any previous history of thyroid disease. Physical examination of the thyroid gland is normal. Labs show:

Triiodothyronine (T3), serum: 1 A nmol/L (normal 1 .8 – 2 .9 nmol/L)
Thyroxine (T4), serum: 6 .0 micro-g/dL (normal 5- 12 micro-g/dL)
Thyroid-stimulating hormone, serum: 2.0 micro-U/mL

Which of the following is the most likely diagnosis?

1. Sick euthyroid syndrome ✔
2. Primary overt hypothyroidism
3. Subclinical hypothyroidism
4. Central hypothyroidism
5. Reidels thyroiditis

INCORRECT ✖

The correct answer is 1.

Any patient with an acute, severe illness may have an abnormal thyroid function tests (i.e., abnormal thyroid hormone and TSH levels). This condition is called sick euthyroid syndrome, which is thought to be due to caloric deprivation and an increase in cytokine levels (e.g., interleukin-1 and interleukin-6). For these reasons, thyroid function testing is usually not performed in such patients if there is no clinical suspicion of an underlying thyroid disease. The most common thyroid hormone pattern is a fall in total and free T3 levels, with normal levels of T4 and TSH (often referred to as 'low T3 syndrome'). Decreased levels of T3 occur due to the decreased peripheral conversion of T4 to T3. There is a rough correlation between the severity of the underlying, non-thyroidal illness and fall in T3 levels. If the non-thyroidal illness continues longer, serum T4 and TSH levels also decrease. Likewise, the prognosis of patients is directly proportional to the severity of the thyroid function test abnormalities. On recovery from the non-thyroidal illness, patients usually experience a modest, transient increase in the serum TSH level. This is often misinterpreted as subclinical hypothyroidism; therefore, thyroid function tests are also not performed in patients recovering from major systemic illness, unless there is a strong indication.

(Choices 2 & 3) Decreased total and free T4 levels with increased TSH levels occur in primary clinical hypothyroidism, whereas normal T3 and T4 levels with increased TSH levels occur in subclinical primary hypothyroidism. Serum T3 levels remain normal until the late stages of hypothyroidism; therefore, measuring T3 levels are not generally useful in these patients.

(Choice 4) Low T4 with normal T3 and TSH levels can be seen in central hypothyroidism.

24. Question

1 points

A 45-year-old male presents to your office because his “hands are getting thick and swollen.” He is also having difficulty with wearing shoes because his feet have become large. His blood pressure is 150/90 mm Hg. On examination, he has enlarged, swollen hands and feet. He has coarse facial features, with prominent frontal bones and jaws. While you are discussing the most likely diagnosis, he appears worried and asks about the complications and risk of death associated with his condition. What is the most common cause of death in patients with this condition?

1. Congestive cardiac failure ✔
2. Hypertensive nephropathy
3. Stroke
4. Brain tumor
5. Adrenal failure

INCORRECT ✖

The correct answer is 1.

Acromegaly is a clinical syndrome that is characterized by growth hormone (GH) excess from somatotroph (pituitary) adenomas. Its clinical features result from the high GH concentration, which also causes excessive production of insulin-like growth factor I (IGF-1). IGF-1 excess leads to the excessive growth of bone and soft tissues. Direct and indirect effects (via IGF-1) of GH excess also contribute to cardiovascular manifestations. Patients have an increased incidence of coronary heart disease, cardiomyopathy, arrhythmias, left ventricular hypertrophy, and diastolic dysfunction. The overall leading cause of death in patients with acromegaly is cardiovascular, accounting for 38-62% of deaths. Respiratory causes account for 0-25%, and malignancy accounts for 9-25% of deaths. Hypertension occurs in approximately 30% of patients; however, hypertension itself is not solely responsible for the increase in cardiovascular mortality. Normalization of hormone levels following successful treatment of acromegaly markedly reduces cardiovascular mortality.

(Choices 2, 3, 4 & 5) Patients with acromegaly can succumb due to non-cardiac reasons; however, these occur less commonly than cardiovascular causes.

The following are some non-cardiac causes of death in patients with acromegaly:

1. Strokes: the incidence of strokes is higher in patients with acromegaly
2. Colon cancer: this condition is thought to occur with increased frequency
3. Renal failure: this can result from hypertension and hyperglycemia
4. Adrenal failure: this can occur due to hypothalamo-pituitary problems due to a pituitary tumor, although surgical resection and radiotherapy of the pituitary tumor can also cause secondary adrenal failure.

25. Question **1 points**

A 65- year-old man presents with a t-year history of impotence and decreased libido. He has a 15-year history of type 2 diabetes mellitus, which is controlled with diet. He denies any cardiac problems, visual changes or symptoms of neuropathy. The genitourinary examination reveals decreased testicular size and absent gynecomastia. The rest of the physical examination is unremarkable. The laboratory report shows:

Hemoglobin A 1 c: 5%
Testosterone: 2.0 ng/dl (Normal 3 -10 ng/dl)
LH: 3 U/L
FSH: 4U/L

What is the best next step in the management of this patient?

1. Insulin therapy
2. Angiography of the deep arteries of the penis
3. Doppler ultrasonography of penile blood flow
4. Measure the serum prolactin level ✔
5. Measure the serum estradiol level

INCORRECT ✖

The correct answer is 4.

Erectile impotence in diabetic patients may be due to multiple reasons, including autonomic neuropathy, medications, functional hypogonadism, and problems with penile circulation. It is thus essential to have a broad differential diagnosis to appropriately include all plausible causes of the patient's symptoms. Functional hypogonadism is characterized by low testosterone and low gonadotrophin (LH and FSH) levels in the presence of a significant systemic illness (e.g., uncontrolled diabetes); the underlying pathology is defective gonadotrophin-releasing hormone (GnRH) secretion. In contrast, primary (testicular) hypogonadism is characterized by elevated serum gonadotrophin levels.

In this case, the patient's diabetes is well-controlled, as evidenced by his normal HbA1c level. At this point, the most likely diagnosis is secondary (central) hypogonadism, which is characterized by hypogonadism, low testosterone levels and inappropriately normal gonadotrophin levels. Measurement of serum prolactin levels is the most important biochemical test to perform in patients with suspected central hypogonadism. Regardless of the cause, high serum prolactin levels inhibit the release of GnRH, thereby resulting in hypogonadism. Prolactin-secreting pituitary tumor is one of the most important causes of elevated prolactin levels.

(Choice 1) The patient's normal HbA1 c level indicates that his diabetes is well controlled with his current regimen; therefore, insulin treatment is not warranted.
(Choices 2 & 3) Duplex Doppler ultrasonography or angiography of the penile deep arteries may be indicated when a vascular etiology of erectile impotence is being suspected. Since the patient's features are more suggestive of central hypogonadism, these tests should not be utilized at this time.
(Choice 5) In primary hypogonadism, supranormal serum FSH and LH concentrations stimulate testicular aromatase activity, thereby leading to increased estradiol production.

26. Question

1 points

A 20-year-old white female presents with polyuria, polydipsia, weakness and fatigue. Her past medical history is insignificant. She has been smoking a pack of cigarettes daily for the last two years. She drinks alcohol on weekends. She denies the use of any drugs. Her mother is diabetic, and her father died of a myocardial infarction at the age of 40 years. Her pulse is 74/min, blood pressure is 11 0/70 mm Hg and temperature is 37.2C. Laboratory studies show:

Glucose: 90 mg/L
Sodium: 140 mEq/L
Potassium: 2.2 mEq/L
Bicarbonate: 42 mEq/L
Renin activity: Elevated
Aldosterone: Elevated

The urine assay for diuretics is negative, and urine chloride concentration is 60 mEq/L (Normal = 20-250 mEq/L). Based on these findings, what is the most likely diagnosis?

1. Primary hyperaldosteronism
2. Diuretic abuse
3. Bartter's syndrome ✔
4. Surreptitious vomiting
5. Renin-secreting tumor

INCORRECT ✖
The correct answer is 3.
The differential diagnoses of normotensive patients with hypokalemia and metabolic alkalosis include:

1. Diuretic use
2. Surreptitious vomiting

3. Bartter's syndrome
4. Gitelman's syndrome

In this patient, the most likely diagnosis is Bartter's syndrome. Classic Bartter's syndrome usually presents early in life as polyuria, polydipsia, and growth and mental retardation; however, such presentation can occur much later. The underlying pathology is defective sodium and chloride reabsorption in the thick ascending limb of the loop of Henle, thereby resulting in hypovolemia and consequent activation of the renin-angiotensin aldosterone system (RAAS). Activated RAAS then causes an increase in potassium and hydrogen ion secretion, which eventually leads to hypokalemia and metabolic alkalosis.

(Choices 1 & 5) Primary hyperaldosteronism and renin-secreting tumors are characterized by hypertension, metabolic alkalosis and hypokalemia. Measurement of the plasma renin activity (PRA) and plasma aldosterone levels (PA) may be used to distinguish between these two diagnoses. In primary hyperaldosteronism, PRA is suppressed and PA is elevated; whereas, in renin-secreting tumors, both PRA and PA are elevated.

(Choice 2) The most common cause of hypokalemia seen in clinical practice is the use of diuretics. It may be very difficult to differentiate this diagnosis from Bartter's syndrome, especially if there is no documented diuretic use in the patient's medical records. If diuretic abuse is strongly suspected, measurement of the urine diuretic level can be performed.

(Choice 4) In patients with surreptitious vomiting, characteristic physical findings (e.g., scars/calluses on the dorsum of the hands, dental erosions) may be present. Scars occur as a result of repeated injury to the hand as the patient induces vomiting, and dental erosions result from exposure to gastric acid. Patients also have low urine chloride concentration due to hypovolemia and hypochloremia.

27. Question

1 points

A 15-year-old female is brought to the emergency department with confusion, rapid breathing and abdominal pain. She had been in her usual state of health until three days ago, when she developed runny nose, dry cough and fever. She subsequently developed urinary frequency, progressive fatigue, and somnolence. On physical examination, her mucous membranes are dry and there is abdominal tenderness without rebound. Laboratory findings are given below.

Hematocrit: 42%
WBC count: 13,000/mm3
Sodium: 145 mEq/l
Potassium: 5.7 mEq/l
Bicarbonate: 9 mEq/l

Which of the following is most likely decreased in this patient?

1. Liver glucose production
2. Blood renin activity

3. Circulating free fatty acids
4. Total body potassium stores ✔
5. Urine solute excretion

INCORRECT ✖

The correct answer is 4.

This teenager presents with dry mucous membranes, polyuria, decreased level of consciousness, diffuse abdominal pain, and metabolic acidosis (low bicarbonate) in the setting of an acute upper respiratory infection. The most likely explanation for these findings is diabetic ketoacidosis (OKA) in a patient with undiagnosed type 1 diabetes.

In patients with diabetes, infection can precipitate OKA. This is because infections cause systemic release of insulin counterregulatory hormones like catecholamines and cortisol. The resultant relative excess of glucagon causes hyperglycemia, ketonemia, and an osmotic diuresis. This diuresis is accompanied by a net renal loss of total body potassium (K+) stores. Despite this reduction in K+ stores, however, the serum K+ concentration may actually be elevated, as acidemia and decreased insulin activity cause K + to be redistributed to the extracellular fluid compartment. Thus, this patient most likely has a total body K+ deficit despite her hyperkalemia. The mild leukocytosis is consistent with infection and/or OKA.

(Choice 1) Hepatic gluconeogenesis would be increased in this patient, both because of the increased ratio of circulating glucagon to insulin and because of the increased circulating levels of catecholamines and cortisol.

(Choice 2) OKA causes an osmotic diuresis and a reduction in the effective circulating blood volume. This activates the renin-angiotensin-aldosterone axis and accelerates renal potassium losses.

(Choice 3) OKA is characterized by increased circulating free fatty acids due to an underlying relative excess of glucagon to insulin and a consequent increase in lipolysis.

(Choice 5) Hyperglycemia and hyperketonemia in OKA cause osmotic diuresis and increased urinary excretion of glucose, ketones, Na+, K+, Mg++, and phosphate.

28. Question

1 points

A 48-year-old male is referred to you for sexual problems. He has been having problems with attaining erections for the past six months. Prior to the development of this problem, he had an active and satisfactory sexual life. He denies any other medical symptoms and is not on any medication. His marital life is strained due to frequent verbal arguments with his wife. He denies the use of any illicit drugs or alcohol. His vital signs are normal. Physical examination is insignificant, except for obesity. Which of the following diagnostic tests would be most helpful in this patient?

1. Thyroid profile
2. Blood sugar levels
3. 24-hour urine cortisol
4. Nocturnal penile tumescence ✔
5. CT scan brain

INCORRECT ✖

The correct answer is 4.

In patients with erectile dysfunction (ED), it is important to determine whether the underlying cause is psychogenic or organic. Normal eugonadal men experience spontaneous erections during REM sleep and on waking up. Normal nocturnal and early morning erections indicate intact vascular and nerve supplies to the penis; therefore, a history of nocturnal or early morning erections should be asked routinely in patients with ED. Documentation of nocturnal penile tumescence helps in differentiating organic from psychogenic causes. Since nocturnal penile tumescence is involuntary, it is preserved in patients with psychogenic causes, and absent in patients with organic causes. Sleep studies can be performed to check for nocturnal penile tumescence; however, these are expensive and time-consuming. Devices such as RigiScan obviate the need for doing a whole sleep study, and provide very reproducible information about nocturnal penile tumescence.

In this case, it is very likely that the patient has developed erectile dysfunction (ED) due to a psychological cause (i.e., marital discord); however, information on whether he has nocturnal erections is lacking. Nocturnal penile tumescence testing is therefore the best next step in his management.

(Choice 1) Measurement of TSH, prolactin and testosterone levels is typically performed for evaluating organic hormonal causes of erectile dysfunction. Both hypothyroidism and hyperthyroidism can lead to erectile dysfunction. In this patient, a thyroid profile should still be performed even if he denies any medical symptoms; however, since the question is asking for the most helpful test, nocturnal penile tumescence test remains as the best answer.

(Choice 2) Autonomic dysfunction from diabetes mellitus can lead to erectile dysfunction; however, the patient denies any other symptoms, and clearly acknowledges a strained relationship with his wife, which is the more likely cause of his symptoms.

(Choice 3) The 24-hour urine free cortisol level is helpful in diagnosing Cushing syndrome, which can cause male erectile dysfunction via multiple mechanisms. Screening for Cushing syndrome is not performed
unless it is suspected clinically. Since this patient does not have any clinical features that are suggestive of Cushing's syndrome, measurement of 24-hour urinary free cortisol is not warranted.

(Choice 5) CT is warranted when a particular neurological disorder (e.g., prolactinoma, stroke, multiple sclerosis) is suspected as the underlying cause of the erectile dysfunction. This patient's medical history and physical examination give no indication for the presence of

any neurological disorder.

29. Question

1 points

A 46-year-old white female who has a history of breast cancer presents with back pain. Plain x-ray shows lytic lesions in the thoracic spine. Lab tests show serum calcium of 13 .1 mg/dl. Her serum parathyroid hormone (PTH) is 10 pg/ml (Normal is 10-55pg/ml). Which of the following is most likely to be responsible for her hypercalcemia?

1. Cytokines ✔
2. PT HRP
3. Ectopic PTH
4. Calcitriol

INCORRECT ✖

The correct answer is 1.

Malignancy is one of the most frequent causes of hypercalcemia. There are various mechanisms by which malignancy produces hypercalcemia. These are: the production of cytokines, parathyroid hormone related peptide, calcitriol and ectopic PTH.

(Choice 1) Tumors that are metastatic to bone cause local osteolysis by production of cytokines such as IL-1 and tumor necrosis factors (TNF). The most frequent tumors that produce hypercalcemia by this mechanism are lung cancer and breast cancer.

(Choice 2) The most common cause of hypercalcemia in patients with nonmetastatic solid tumors is production of parathyroid hormone related peptide (PT HRP). In such cases, serum PTH is typically low (Normal PTH 10-55 pg/ml).

(Choice 3) Ectopic PTH production by tumor cells is a very rare cause of hypercalcemia and has been reported in ovarian tumors, lung cancer and neuroectodermal tumors.

(Choice 4) Hypercalcemia in cases of Hodgkin's disease is almost always produced by calcitriol.

30. Question

1 points

A 32-year-old male presents to the office with complaints of impotence and absent morning erections. Two months ago, he was involved in a car accident, from which he obtained a pelvic fracture with urethral injury; early realignment of the urethral tear was performed. He is currently not

taking any medications. He does not smoke or consume alcohol. What is the most probable cause of this patient's condition?

1. Venogenic
2. Endocrinologic
3. Neurogenic ✔
4. Systemic
5. Situational

INCORRECT ✖

The correct answer is 3.

Penile erections normally occur during REM sleep and on waking up. To achieve an erection, intact nerves and blood supplies are essential. Failure to achieve a spontaneous erection during the night and/or early morning is pathognomic of organic erectile dysfunction (ED). ED is a very common complication in patients with a pelvic fracture and urethral injury. The incidence of ED is as high as 30% in patients requiring catheter placement only, and can reach as high as 70% in those undergoing open reduction. The cause of impotence in these situations is most probably injury of the parasympathetic nerve fibers; however, recent studies indicate that arterial insufficiency may be a contributing factor.

(Choice 1) Venogenic ED may develop after disruption of the tunica albuginea (e.g., penile fracture).

(Choices 2 & 4)) Endocrinologic causes of ED include hyperprolactinemia and testosterone deficiency. Diabetes mellitus causes ED through several complications (e.g., vascular, neural, etc.), not by the deficiency of any hormone per se; therefore, it can be considered as a systemic cause.

(Choice 5) Situational ED is a variant of psychogenic ED, occurring only during certain situations which cause anxiety. Nighttime and morning erections are preserved in patients with situational ED.

31. Question

1 points

A 50-year-old male presents with polyuria and polydipsia. He has smoked 1 pack of cigarettes daily for the past 30 years. He denies having any past medical problems. His mother and one maternal uncle are diabetic. His height is 5'8" (172 cm), weight is 180 lbs (81.6 kg), temperature is 37 C (98.6 F), pulse is 75/min, blood pressure is 150/90 mm Hg, and respirations are 15/min. Examination of all the systems is unremarkable. Chemistry panel shows:

Sodium: 140 mEq/L
Potassium: 4 .1 mEq/L
Bicarbonate: 26 mEq/L
Blood glucose: 210 mg/dl
BUN: 12 mg/dl
Creatinine: 0.9 mg/dl

The patient is diagnosed with type 2 diabetes mellitus. He is advised exercise and dietary modification. He is referred to an ophthalmologist and appropriately screened for diabetic retinopathy. What is the most sensitive test to screen for nephropathy in this patient?

1. Creatinine clearance
2. Dipstick testing of urine for protein
3. Random urine for microalbumin/creatinine ratio ✔
4. Renal ultrasound
5. Oral glucose tolerance test

INCORRECT ✖
The correct answer is 3.
Development of nephropathy is preceded by development of excessive protein excretion, the initial stages of which is termed microalbuminuria. Patients with microalbuminuria typically have a urine albumin excretion value between 30-300 mg/24 hr. (Normal urine protein excretion is< 30 mg/24 hr). Spot urine collection and timed urine collection for the measurement of urine microalbumin to creatinine ratio are generally accepted as good screening methods for microalbuminuria. Although 24-hour urine collection is slightly more accurate in screening for microalbuminuria, its inconvenience to patients makes it less preferred by physicians.
(Choice 1) During the initial phases of diabetic nephropathy, there is glomerular hyperfiltration and an increase in creatinine clearance. Creatinine clearance then declines with the progression of diabetic nephropathy; however, it can still be relatively normal with proteinuria (micro and macroalbuminuria) due to high initial values. Low creatinine clearance occurs when the renal damage is fairly advanced. Due to these reasons, creatinine clearance in not used as a screening tool for diabetic nephropathy.
(Choice 2) Routine dipstick testing is not recommended during the initial stages of nephropathy. Dipsticks can only detect excessive urinary protein excretion when the level is > 300 mg/24 hr (macroalbuminuria).
(Choice 4) Ultrasound is not useful as a screening tool for diabetic nephropathy. The kidney size is relatively preserved until advanced renal failure occurs. Ultrasound should be considered if non-diabetic renal damage (e.g., obstructive uropathy) is suspected clinically.
(Choice 5) Oral glucose tolerance testing has no role in screening patients for diabetic nephropathy.

32. Question **1 points**

A 45-year-old white female presents with complaints of diffuse body pains and muscle weakness. She was diagnosed with celiac sprue several years ago. She admits to non-compliance with her gluten-free diet. After the appropriate evaluation, she is given a diagnosis of osteomalacia secondary to vitamin D deficiency. She is started on vitamin D, calcium and phosphate, and begins to improve with this treatment. Which of the following is most likely to occur with vitamin D deficiency?

1. Defective mineralization of bone ✔
2. Defective mineralization of bone and cartilage
3. Disordered skeletal remodeling
4. Defective formation of collagen
5. Low bone mass with normal mineralization

INCORRECT ✖

The correct answer is 1.

Osteomalacia is characterized by defective mineralization of the bones. It is seen in adults, occurring after
the epiphyseal growth plates have closed. Vitamin D deficiency leads to decreased availability of calcium and phosphorus at the mineralization sites, resulting in poor mineralization, with consequent softening of the bone and development of deformities, particularly in the weight-bearing bones of the lower extremities.

(Choice 2) Rickets is characterized by defective mineralization of both bone and growth plate cartilage. It is also caused by vitamin D deficiency, but is seen only in children.

(Choice 3) Disordered skeletal remodeling in focal areas of the bone is the underlying pathophysiology of Paget's disease of the bone. Localized osteoclast activation leads to increased focal bone resorption. In response to increased resorption, osteoblasts lay new bone in the focal resorptive lesions. These focal areas thus acquire a characteristic, disorganized bone structure and loss of normal lamellar structure.

(Choice 4) Defective collagen formation is seen in patients with osteogenesis imperfecta. The specifically involved collagen is Type-1 collagen, which is required for the formation of bone, tendon, ligament, skin, and sclera. Osteogenesis imperfecta has a wide variation in phenotype and degree of severity, which is dependent on the type of genetic defects. Mild cases can be missed for long periods of time. Bone density and formation are decreased, whereas bone resorption is increased. Bisphosphonates act by reducing the bone turnover, and have been shown to reduce fractures in children.

(Choice 5) Osteoporosis is characterized by low bone mass, but the bone that is present is normally mineralized per unit volume. There is emerging evidence that with low bone mass in osteoporosis, micro architectural deterioration of bone tissue is present. Micro architectural deterioration could be a risk factor for fragility fractures independent of the bone mass.

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